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PATENT
ATTY. DOCKET NO.: P67552US0

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

WOLFGANG BILLINGER, et al.

Group Art Unit: 3644

Serial No. 10/053,666

Examiner: S. Holzen

Filed: January 24, 2002

For: DEVICE FOR CONNECTING MOVABLE PARTS WITH STRUCTURAL
ELEMENTS OF AIRPLANES AND THE LIKE

DECLARATION OF HELMUT KAUFMANN & RUDOLF GRADINGER

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

We, Helmut Kaufmann and Rudolf Gradinger, do hereby declare the following:

1. We, Helmut Kaufman and Rudolf Gradinger, are both currently employed by the ARC Leichtmetallkompetenzzentrum Ranshofen GmbH (hereafter "LKR"), an R&D company in Austria focused on light metal technology. LKR projects range from alloying to component design, mainly with respect to aluminum and magnesium alloys. However, in the case of design and stress engineering, parts made out of steel, titanium, polymers or ceramics may be treated as well.

2. I, Helmut Kaufman, received my M.S. in mechanical engineering and my Ph.D. in material science from the Montanuniversität Leoben (Austria) in 1987 and 1992, respectively. After serving for one year as a visiting scientist at the Materials

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Science Department of the Massachusetts Institute of Technology (MIT) in the United States in 1989, I joined Austria Metall AG (AMAG) where I conducted research work in casting technology. In 1994, I moved to Ube Europe GmbH in Düsseldorf (Germany) where my work focussed on Squeeze Casting and Semi-Solid Casting. Upon returning to Austria in 1997, I took the position of head of the Light Metal Competence Center of LKR in Ranshofen. In 2000, when LKR became a wholly owned subsidiary company of the Austrian Research Centers GmbH, I was appointed Managing Director of LKR.

3. I, Rudolf Gradinger, received my M.S. in mechanical engineering from the Vienna University of Technology (Austria) in 1997. In that same year I joined the Light Metal Competence Center of LKR in Ranshofen and started my research work in light weight design. In 2001, I became the head of the joining technology working group at LKR and, in 2003, expanded my responsibilities to include simulation. In 2004, I merged the working groups of joining technology, simulation and new applications into a new Light Weight Design Group of which I am the head. Also in 2004, I held a lecture at Wels College of Engineering on the topic of simulation and computer aided engineering (CAE) in Materials Engineering.

4. As a result of our collective education and experience, it is our opinion that persons of ordinary skill in the aviation field as related to composite technology would have at least a bachelor's degree in mechanical engineering, and would have at least several years of experience in mechanical engineering.

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5. Drawing upon our expertise in this industry and our understanding of the level of ordinary skill in the art at the time the above-captioned application was filed (January 24, 2002), we can offer our expert opinion as to how persons of ordinary skill in the art perceived the use of composite technology as it pertains to the aviation field.

6. Prior to 2004 it was conventional to make aircraft spoiler hinges of aluminum or titanium alloys, mainly forgings. In addition, what was known by persons of ordinary skill was reliance upon metal fasteners, such as screws or rivets, for secure connection of the metal fittings to the movable parts.

7. In 2004, we came to know of the design for a carbon fiber reinforced plastic/resin transfer molding (CFRP/RTM) center hinge fitting, i.e., aircraft spoiler hinge, developed by Mr. Wolfgang Billinger ("the Billinger design") at Fischer Advanced Composite Components AG. We have reviewed the corresponding subject matter of Mr. Billinger's captioned U.S. patent application, namely Serial No. 10/053,666, which to our view sets forth the CFRP/RTM aircraft spoiler hinge according to his design.

8. Upon hearing of the Billinger design, we were initially surprised by this innovation as previously we had not been aware of any RTM approach for a hinge or fitting design for use with aircraft spoilers.

9. Unlike known methods of prepreg manufacture which employ an autoclave to solidify the prepreg material, the RTM process offers

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more degrees of freedom in aligning the fibers along the main stresses and thus is the first appropriate composite manufacturing method for bulky structurally loaded parts.

10. Using the Billinger design, weight savings on the order of 50 kg per ~~spoiler~~ ^{aircraft} can be achieved without increased cost, as compared with conventional metal fittings. This fact is of great significance and, provided the technical requirements are fulfilled, establishes the cost benefit of the RTM approach as compared to any light weight metal design. (To obtain an analogous weight saving using metal, a comparable light metal design could be made out of titanium, but this would be accompanied by an unacceptable increase in cost.)

11. In aircraft design, one of the areas in which major weight savings are obtained is related to the joining technique used between the hinge and the spoiler. The replacement of screws by adhesive bonding according to the Billinger design therefore provides further weight savings and, unexpectedly, sufficient strength to withstand the known shearing stresses to which movable aircraft parts such as spoilers, landing flaps and control surfaces are subject.

12. In addition, the use of composite material for both the fitting and the spoiler according to the Billinger design results in reduced thermal stresses at the interface between these components due to the similarity in their thermal expansion coefficients. This is an improvement over conventional metal fittings where the thermal

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stresses between the metal and the CFRP at the bearing of the center hinge fitting have to be considered and accommodated.

13. It is thus our opinion that a fitting made of synthetic composite material according to the RTM method, whether joined to the movable part by gluing or formed integrally therewith, is innovative as the same would not have been considered by persons of ordinary skill in the field to be structurally adequate for the high-load hinge application to which the Billinger design is directed.

14. We further declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under section 1001 of Title 18 of the United States Code; and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

11.4.2005

Date

H. Kaufmann
Dr. Helmut Kaufmann

11.4.2005

Date

Rudolf Grading
Dipl.-Ing. Rudolf Grading